OPERATING INSTRUCTIONS

for GANGED VARIACS*

TYPES V-5G2, V-5HG2, V-5G3, V-5HG3, V-10G2, V-10HG2, V-10G3, V-10HG3, V-20G2, V-20HG2 V-20G3, V-20HG3

Where operating requirements cannot be met by individual Variac autotransformers, ganged units, controlled by a single shaft, will usually provide a satisfactory solution. Two- and three-gang standard assemblies are available for the V-5, V-10, and V-20 models. These can be used in both single-phase and three-phase circuits to meet a variety of specialized requirements.

Single-phase combinations are listed below and three-phase combinations on pages 2 and 3. Similar combinations can be devised for the little-used two-phase circuits.

Single-Phase Circuits

When Variacs are operated in series, they can be used on circuits whose voltages are twice the normal voltage ranges of the Variacs. This circuit is particularly useful on 460-volt, single-phase supply, which has hitherto required auxiliary transformers for Variac control. When the 115-volt models are used in series, they have power ratings intermediate between the various H-models used singly. Ratings and other data are listed in Table I, below.

Because there is no common connection between input and output, DO NOT GROUND LOAD.

TABLE I SINGLE-PHASE VARIACS AND VARIAC ASSEMBLIES

		INPUT			OUTPUT							
					KVA		VOLTS		AMPERES		MINIMUM LOAD OHMS	
	TYPE	CONNECTION	See Fig.	LINE INPUT VOLTS	AT LINE INPUT VOLTS	AT MAX. VOLTS	LINE	MAX	RATED	MAX.	AT LINE VOLTS	AT MAX. VOLTS
115-VOLT CIRCUITS	V-5			115	.862	.675	0-115	0-135	5	7.5	15.3	27
	V-10			115	1.725	1.35	0-115	0-135	10	15	7.27	13.5
	V-20			115	3.45	2.70	0-115	0-135	20	30	3.83	6.75
115- TO 230-VOLT CIRCUITS	V-5H			115	.288	.270		0-270	1	2.5		270
	V-10H			115	.575	.540		0-270	2	5		135
	V-5G2	Series	1c	115	.862	.675		0-270	2.5	7.5		108
	V-20H			115	1.15	1.08		0-270	4	10		67.5
	V-10G2	Series	1c	115	1.73	1.35		0-270	5	15		54
	V-20G2	Series	1c	115	3.45	2.70		0-270	10	30		27
230-VOLT CIRCUITS	V-5H			230	.575	.540	0-230	0-270	2	2.5	92	135
	V-10H			230	1.15	1.08	0-230	0-270	4	5	46	67.5
	V-5G2	Series	1b, 1a	230	1.72	1.35	0-230	0-270	5	7.5	30.7	54
	V-20H			230	2.3	2.16	0-230	0-270	8	10	23	33.8
	V-10G2	Series	1b, 1a	230	3.45	2.70	0-230	0-270	10	15	15.3	27
	V-20G2	Series	1b, 1a	230	6.90	5.40	0-230	0-270	20	30	7.7	13.5
230- TO 460-VOLT CIRCUITS	V-5HG2	Series	1c	230	.575	.540		0-540	1	2.5		540
	V-10HG2	Series	1c	230	1.15	1.08		0-540	2	5		270
	V-20HG2	Series	1c	230	2.30	2.16		0-540	4	10		135
460-VOLT CIRCUITS	V-5HG2	Series	1b, 1a	460	1.15	1.08	0-460	0-540	2	2.5	184	270
	V-10HG2	Series	1b, 1a	460	2.30	2.16	0-460	0-540	4	5	92	135
	V-20HG2	Series	1b, 1a	460	4.6	4.32	0-460	0-540	8	10	46	67.5

For connection diagrams, see page 4. For three-phase assemblies, see pages 2 and 3

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Variacs connected in open delta and wye circuits can be used directly on three phase lines. The open delta connection of Figure 2a normally permits operation either to line voltage or to 117% of line voltage. With the H-models, output voltages of more than double the supply voltage can be obtained, although current and power ratings are halved.

Figure 3 shows one of the most useful Variac connections. Because the voltage across each leg of a wye-connected assembly is line volts divided by 3, and since 115-volt Variacs are wound to 135 volts, and 230-volt Variacs to 270 volts, it is possible to operate wye-connected Variacs from three-phase lines of twice the Variac voltage rating. With this connection, the voltage across the Variac on a 460-volt line is 266 volts,

Fig. 4

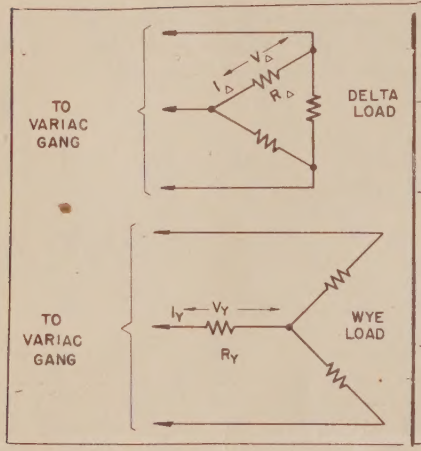


TABLE II
THREE-PHASE ASSEMBLIES

	TYPE	INPUT LINE VOLTS	INPUT CONNECTION	See Fig.	KVA AT LINE VOLTS	KVA AT V
115-VOLT CIRCUITS	V5G2	115	Delta	2a, 2b	1.5	
	V10G2	115	Delta	2a, 2b	3	
	V20G2	115	Delta	2a, 2b	6	
*115- TO 230-VOLT CIRCUITS	V5HG2	115	Delta	2c	.5	
	V10HG2	115	Delta	2c	1	
	V20HG2	115	Delta	2c	2	
230-VOLT CIRCUITS	V5HG2	230	Delta	2a, 2b	1	
	V10HG2	230	Delta	2a, 2b	2	
	V5G3	230	Wye	3	3	
	V20HG2	230	Delta	2a, 2b	4	
	V10G3	230	Wye	3	6	
	V20G3	230	Wye	3	12	
460-VOLT CIRCUITS	V5HG3	460	Wye	3	2	
	V10HG3	460	Wye	3	4	
	V20HG3	460	Wye	3	8	

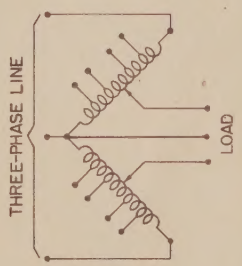


FIGURE 2a

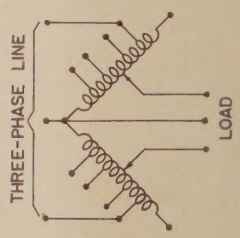
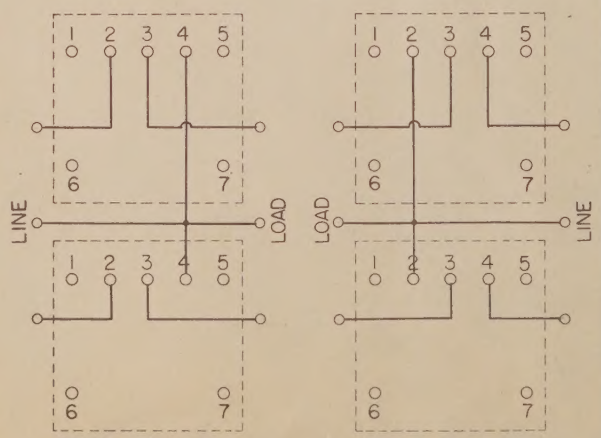
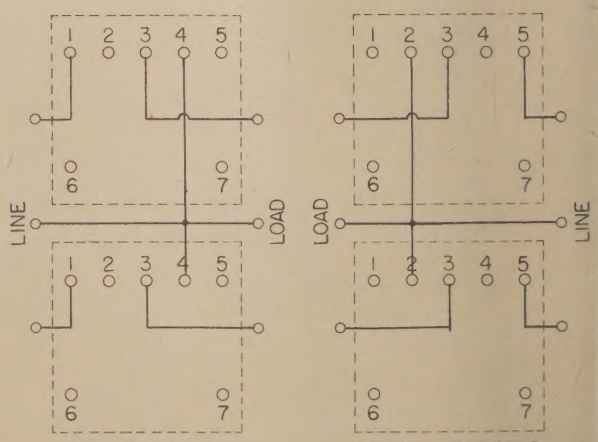


FIGURE 2b



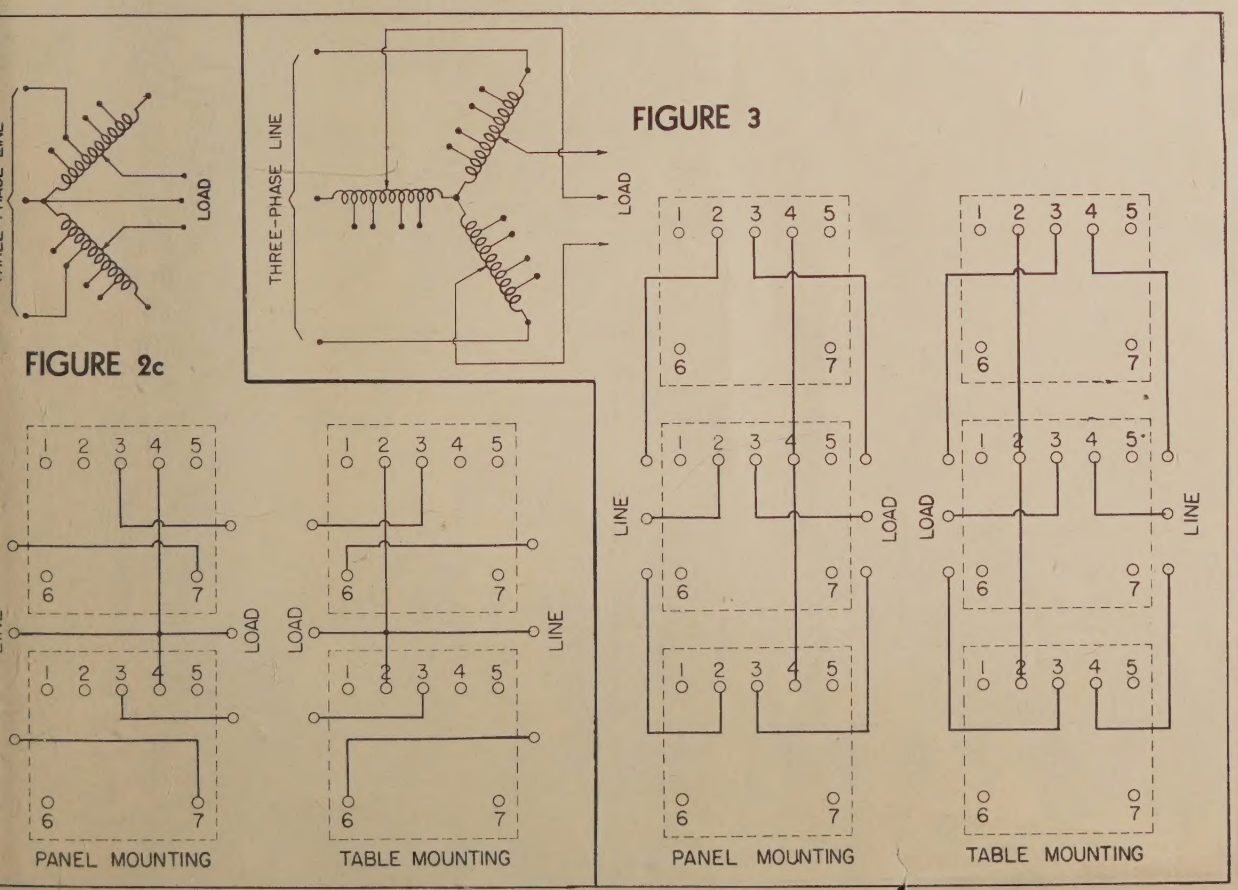


and for a 230-volt line is 133 volts. The overvoltage feature is sacrificed in this circuit, but KVA rating is increased by the ratio of 133:115.

The two common types of three-phase load are shown in Figure 4. For equal load on the supply Variacs, $R_\Delta = 3R_Y$. The relation of R_Δ and R_Y to the single-phase impedance, R, is given by $\frac{R_\Delta}{\sqrt{3}} = R = R_Y\sqrt{3}$

Voltages and circuits as well as minimum load impedances are given in the Table II below. Note that $V_\Delta = V_Y\sqrt{3}$ and $I_\Delta = \frac{I_Y}{\sqrt{3}}$..

OUTPUT											
DELTA LOAD						WYE LOAD					
OUTPUT VOLTS		AMPERES		MINIMUM OHMS		OUTPUT VOLTS		AMPERES		MINIMUM OHMS	
LINE CONNEC.	OVERVOLT. CONNEC.	RATED	MAX.	AT LINE V.	AT MAX. V.	LINE CONNEC.	OVERVOLT. CONNEC.	RATED	MAX.	AT LINE V.	AT MAX. V.
0-115	0-135	2.89	4.33	26.6	46.7	0-66.5	0-78	5	7.5	8.87	15.6
0-115	0-135	5.78	8.67	13.3	23.4	0-66.5	0-78	10	15	4.43	7.8
0-115	0-135	11.5	17.3	6.65	11.8	0-66.5	0-78	20	30	2.21	3.9
	0-270	.577	1.44		467	0-66.5	0-156	1	2.5		156
	0-270	1.16	2.89		233	0-66.5	0-156	2	5		78
	0-270	2.31	5.78		117	0-66.5	0-156	4	10		39
0-230	0-270	1.16	1.44	160	233	0-133	0-156	2	2.5	53.2	78
0-230	0-270	2.31	2.89	79.7	117	0-133	0-156	4	5	26.6	39
0-230		2.89	4.33	53.2		0-133		5	7.5	17.8	
0-230	0-270	4.62	5.78	39.8	58.4	0-133	0-156	8	10	12.3	19.5
0-230		5.78	8.67	26.5		0-133		10	15	8.87	
0-230		11.6	17.3	13.1		0-133		20	30	4.43	
0-460		1.16	1.44	319		0-266		2	2.5	106	
0-460		2.31	2.89	159		0-266		4	5	53.2	
0-460		4.62	5.78	79.5		0-266		8	10	26.6	



CONNECTIONS FOR VARIACS OPERATED IN SERIES

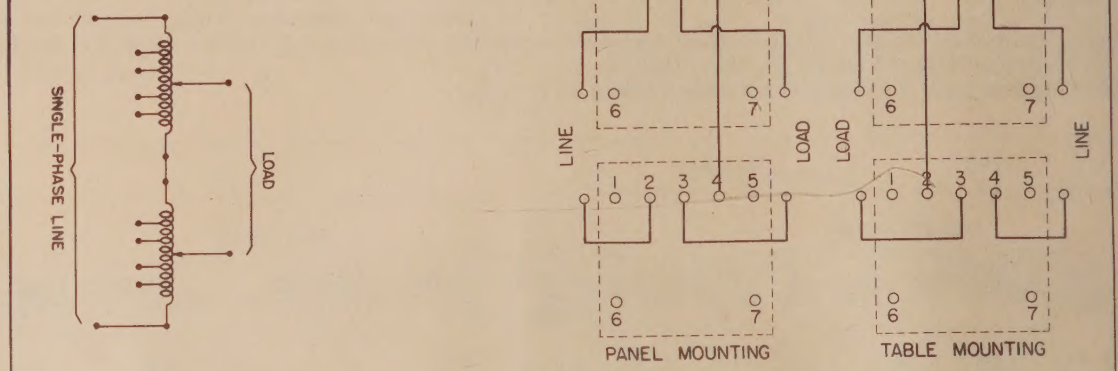


FIGURE 1a

G2 Assemblies 230 volts in 230 volts out

HG2 Assemblies 460 volts in 460 volts out

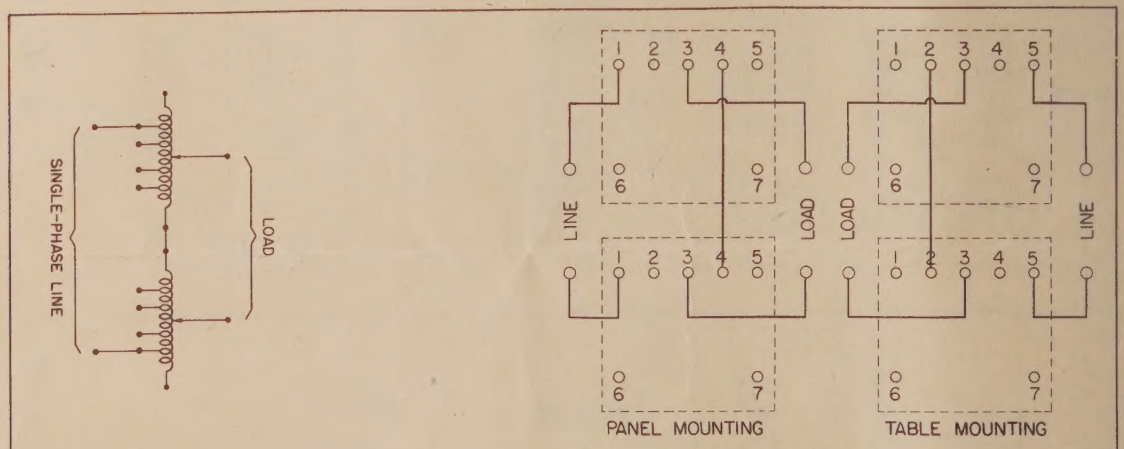


FIGURE 1b

G2 Assemblies 230 volts in 270 volts out

HG2 Assemblies 460 volts in 540 volts out

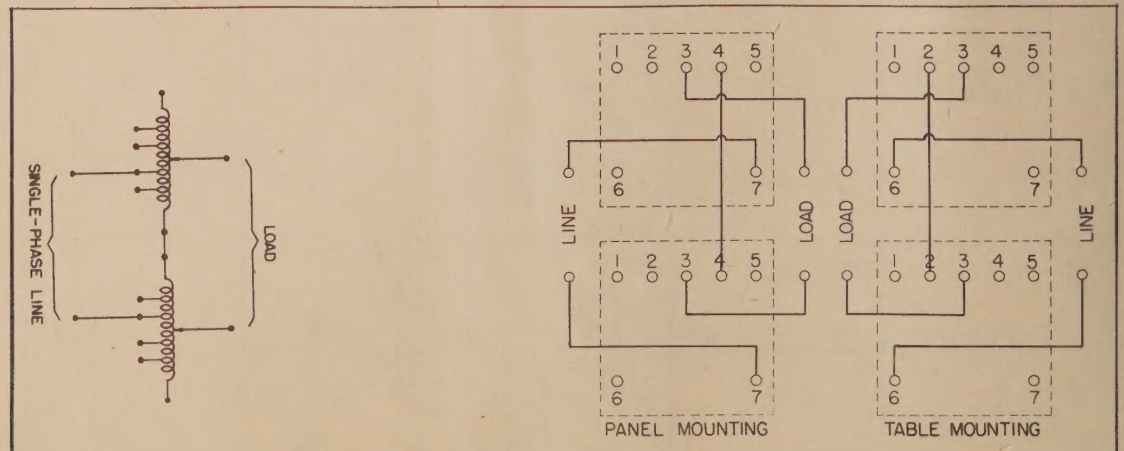


FIGURE 1c

G2 Assemblies 115 volts in 270 volts out

HG2 Assemblies 230 volts in 540 volts out

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